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Coastal Adaptation to Sea Level Rise

Sarah Newkirk – The Nature Conservancy

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Global Weirding

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Obstacles in Talking About Climate Change

- Climate Skepticism
- Human-induced Climate Skepticism
- Uncertainty
- We'll Engineer Ourselves Out

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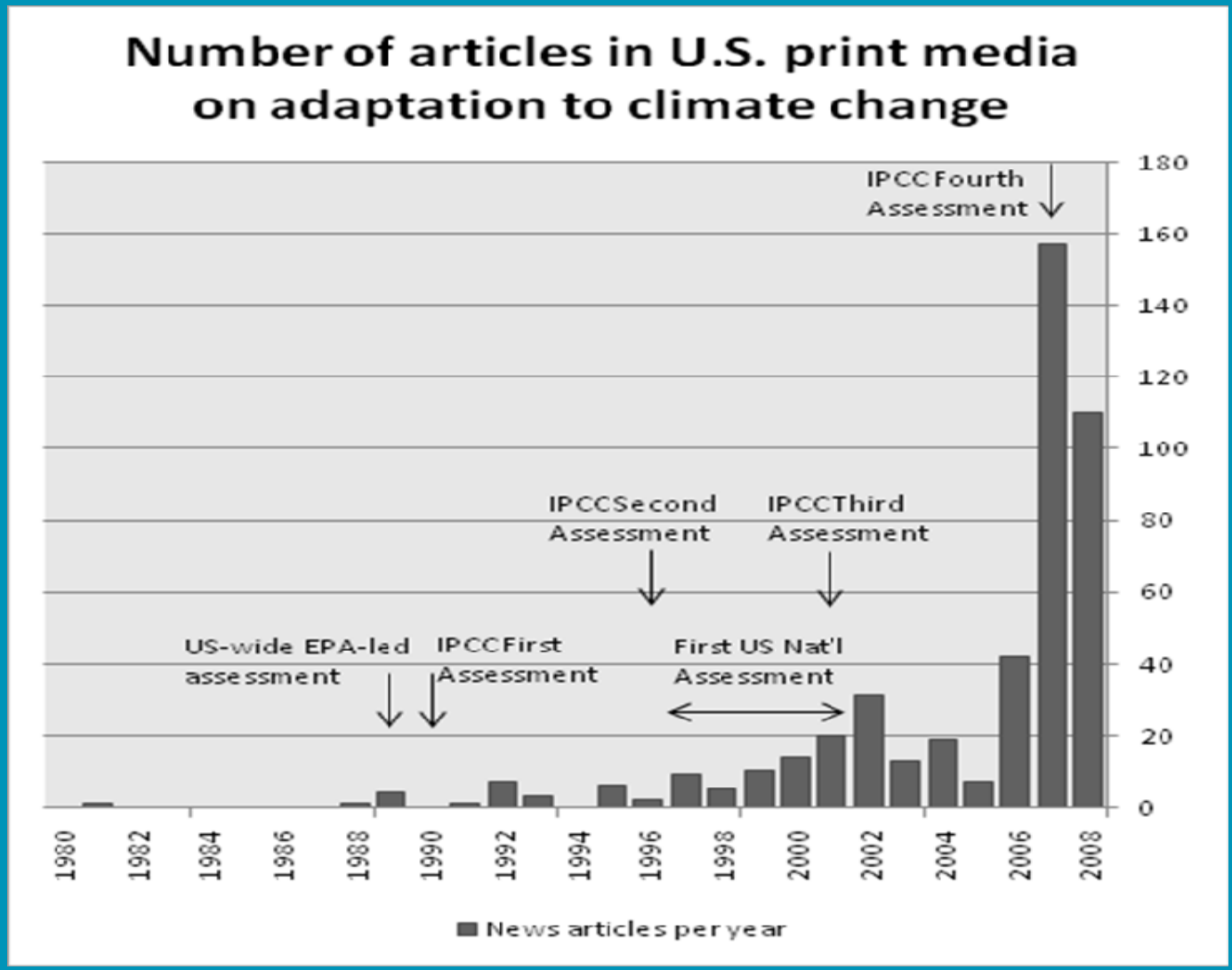
Communicating About Adaptation



Source: Moser, S., *Good Morning America! The Explosive U.S. Awakening to the Need for Adaptation* (May 2009)

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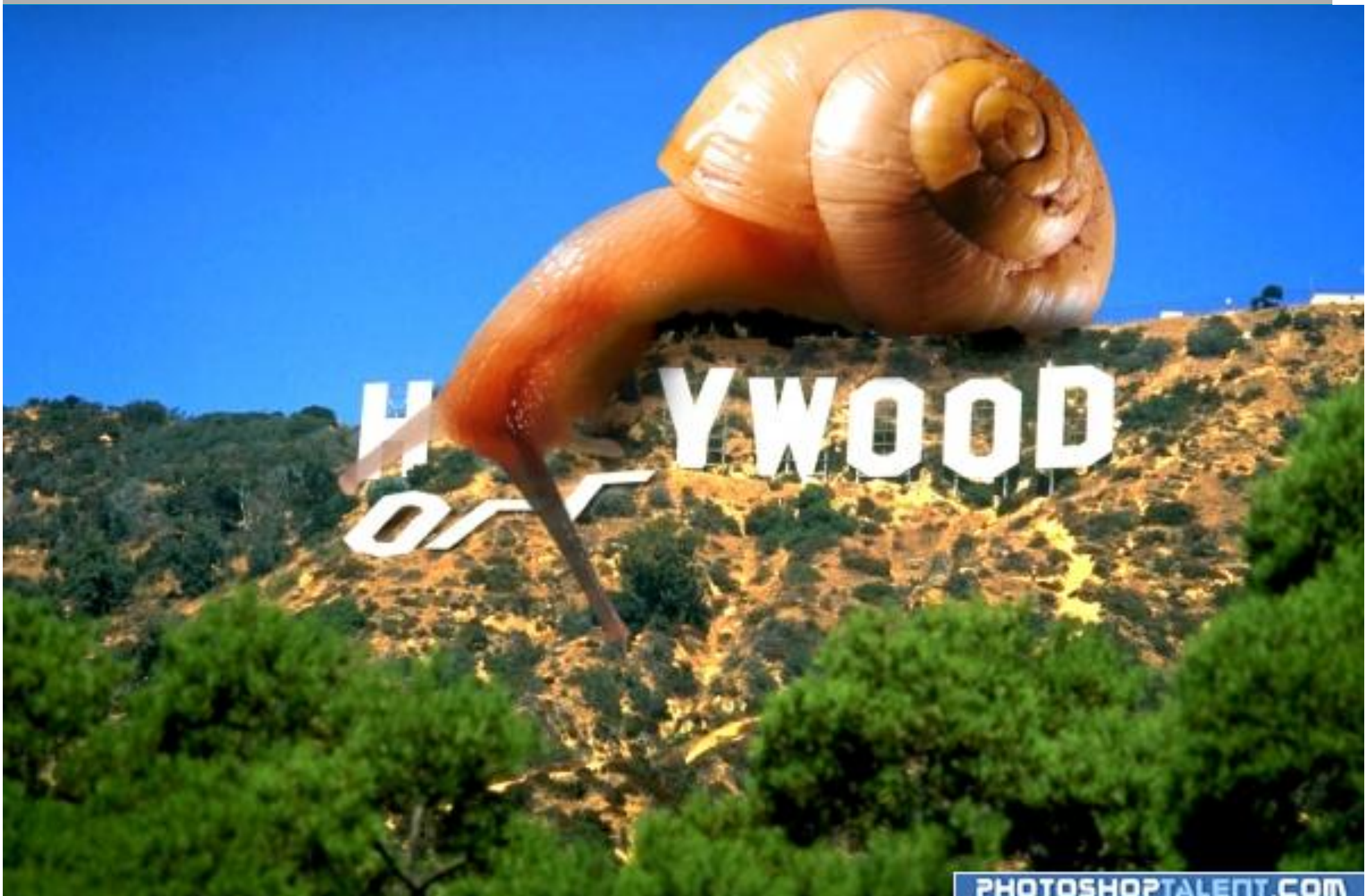
Pitfalls of Communicating Adaptation



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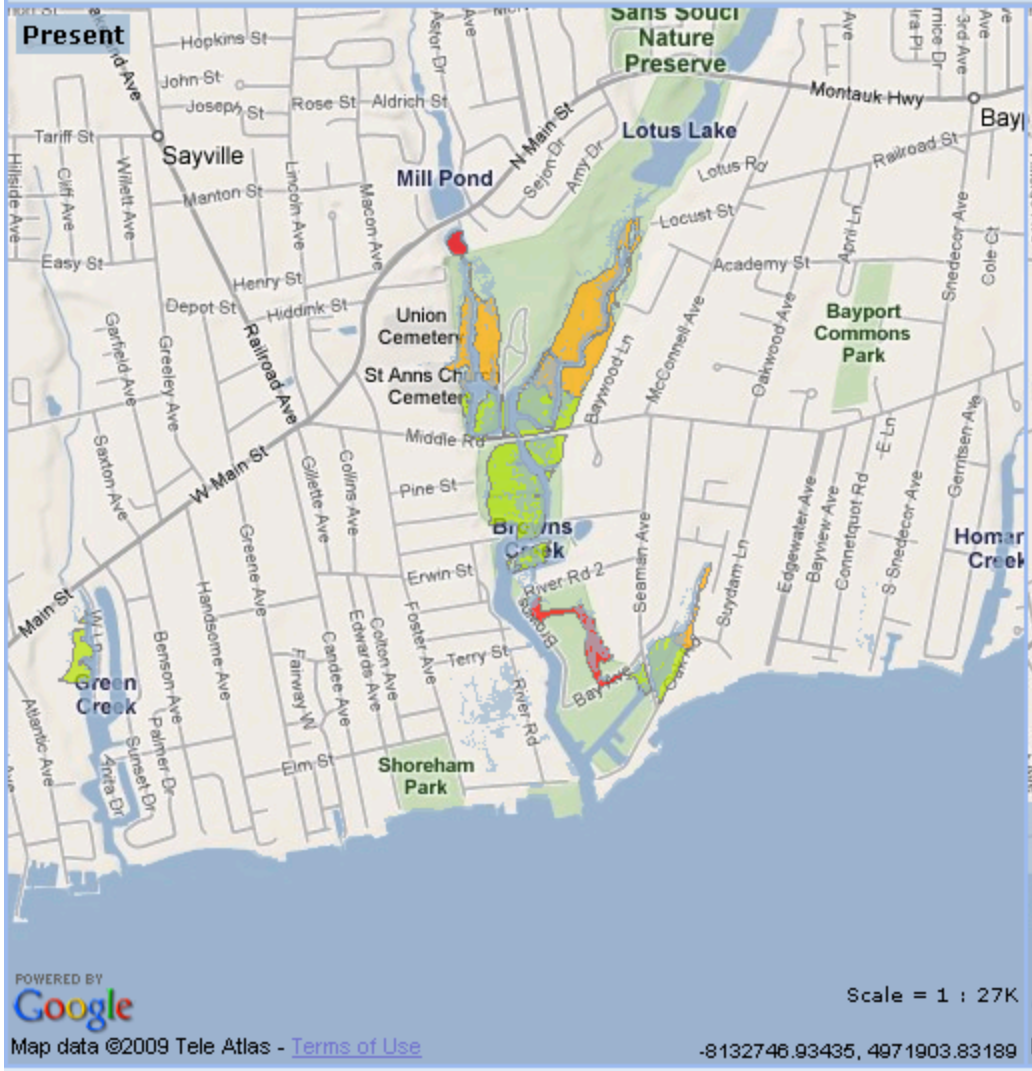
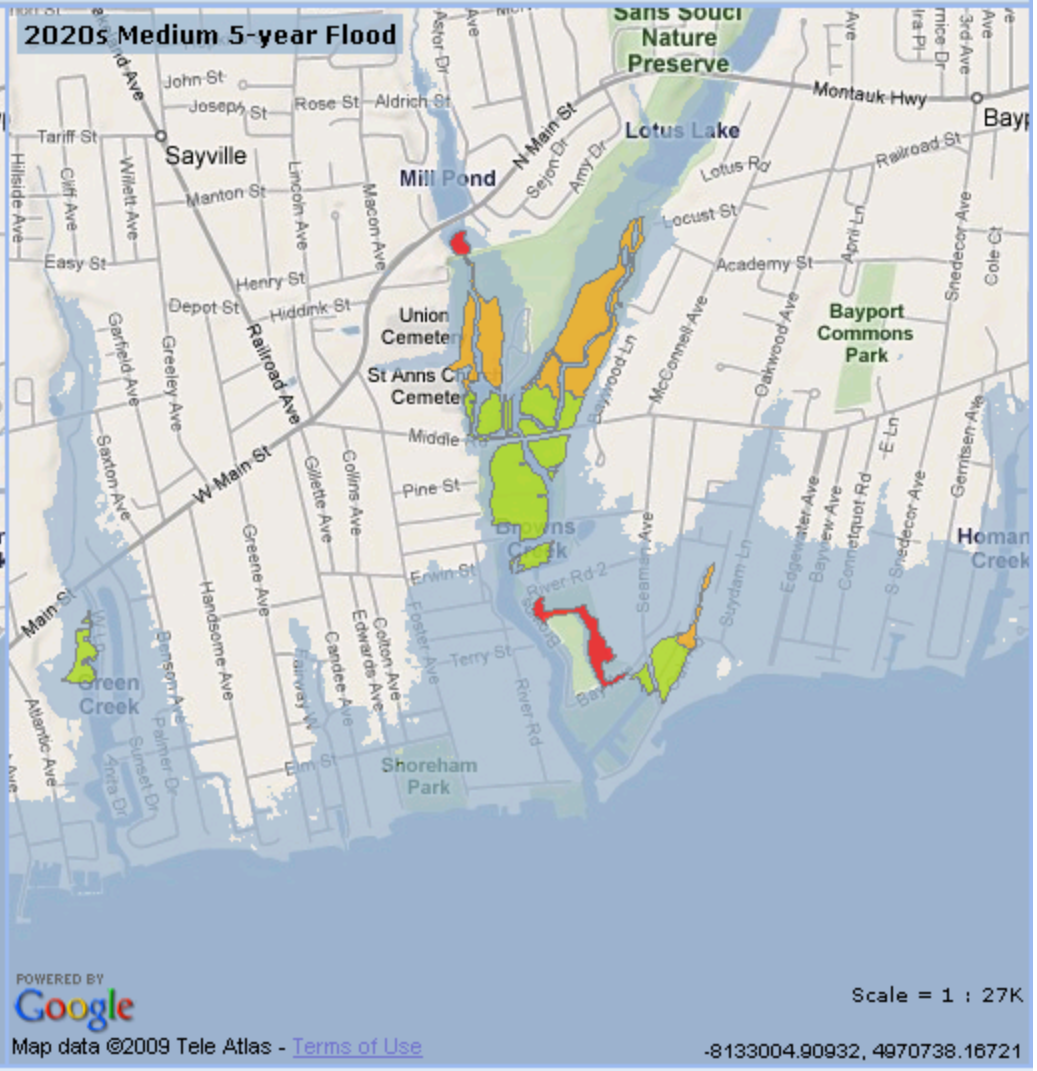
What Creates the Will to Act?

COASTAL RESILIENCE LONG ISLAND

Adapting Natural and Human Communities to
Sea Level Rise and Coastal Hazards

Single View | Background | Flood Scenarios | Year | Sea Level Rise | Storm Surge | View





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Working Hypothesis:

With more complete information, natural resource and land use managers can make decisions that enhance both ecological and socio-economic resilience in the face of sea level rise and coastal hazards.

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The Coastal Resilience project is:

- SLR & storm surge projections;
- Precise elevation data;
- Natural resource and geophysical data;
- Development and land use data;
- Existing & novel regulatory tools to achieve the multiple objectives of Resilience.

NASA Goddard Institute for Space Studies
New York, N.Y.

PACE UNIVERSITY
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MCMVI
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PACE LAW SCHOOL
PACE UNIVERSITY

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NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

ASFPM
ASSOCIATION OF STATE FLOODPLAIN MANAGERS

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Geographic Scope of Phase I

- Windows operating system running on an ArcGIS server
- The interface is a Java script open layers application
- Google maps – base cartography

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Future Scenarios & Impacts

- 3 time periods: 2020s, 2050s, 2080s
- 3 SLR Scenarios: Conservative (A1b), Mod (A2) + High (A2 + meltwater)- NASA/Goddard
- 3 floods: 5 year, Cat 2 storm, Cat 3 storm- NOAA

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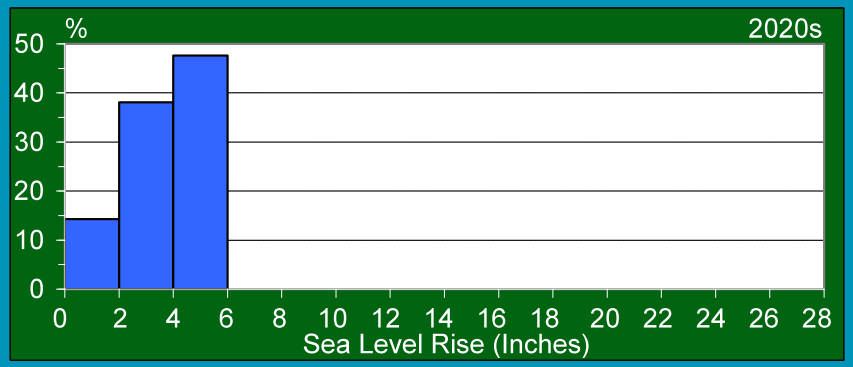
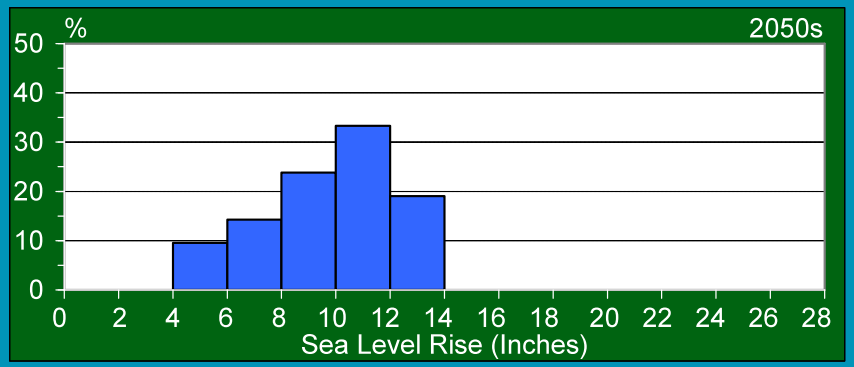
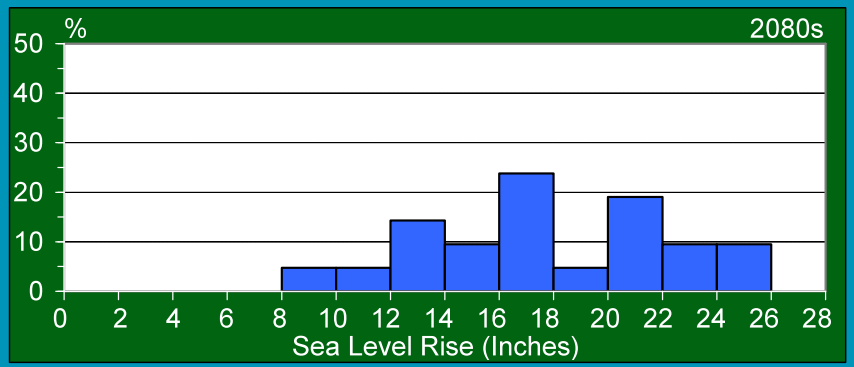
GCM projected SLR – model based probability







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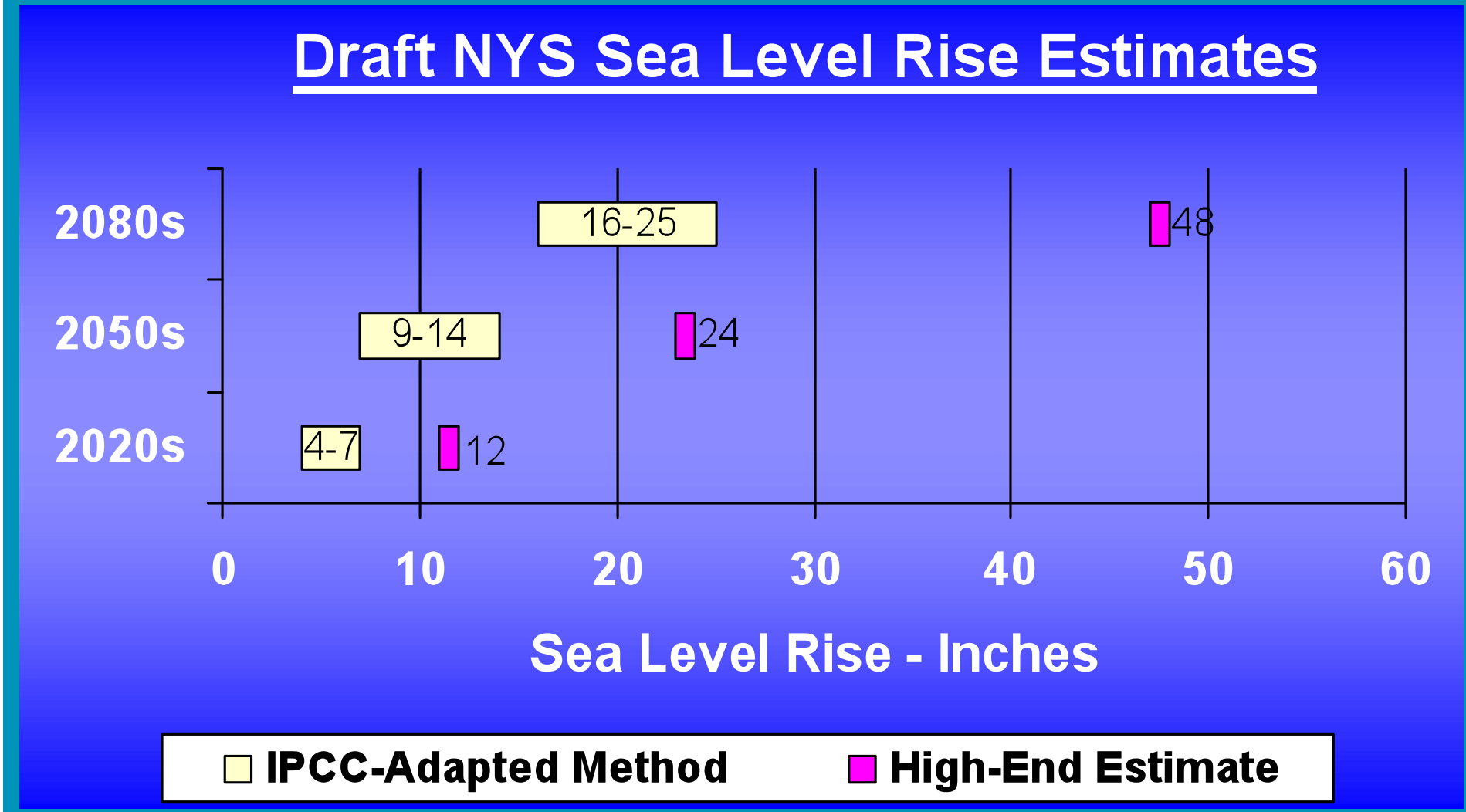
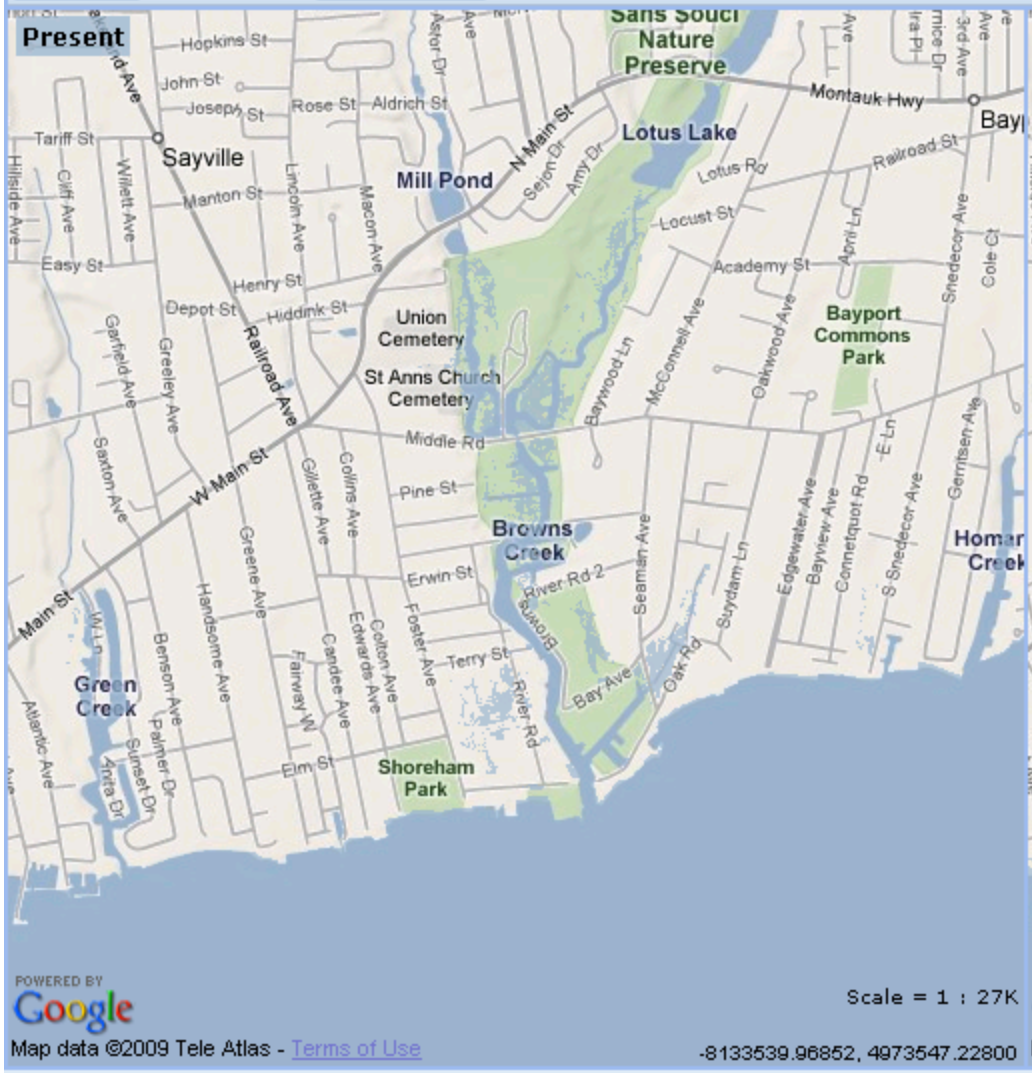
NYS Sea Level Rise Projections

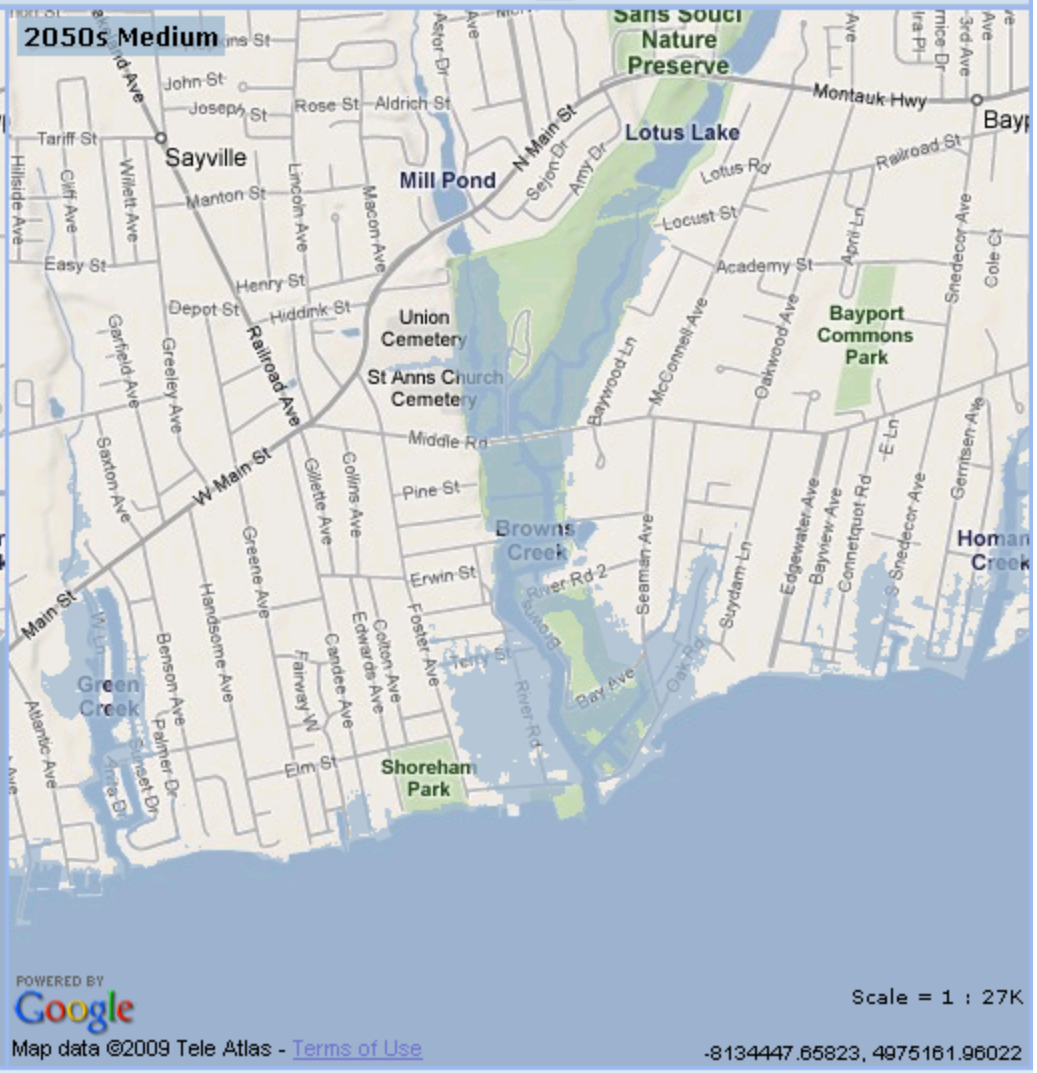


COASTAL RESILIENCE LONG ISLAND

Adapting Natural and Human Communities to
Sea Level Rise and Coastal Hazards

Single View | Background | Flood Scenarios | Year | Sea Level Rise | Storm Surge | View





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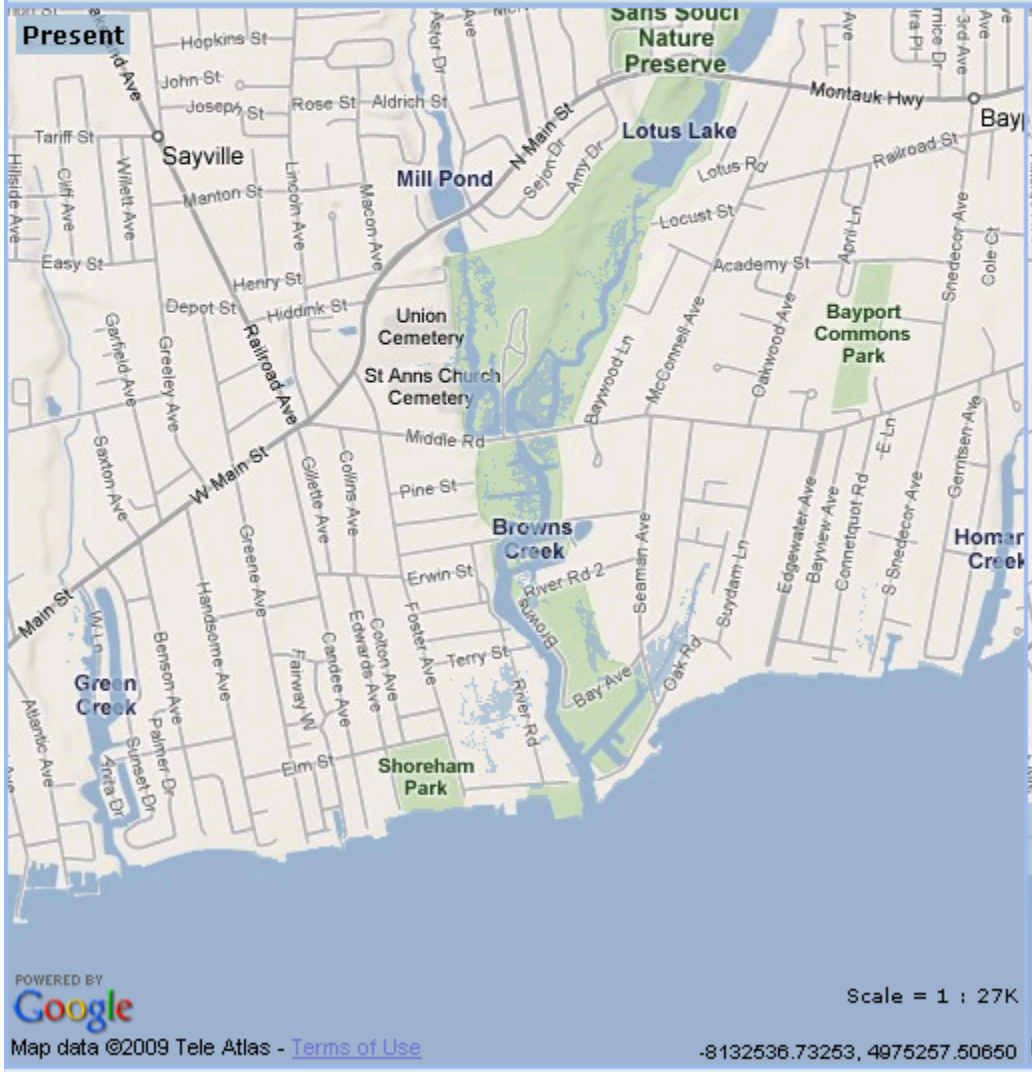
Adapting Natural and Human Communities to
Sea Level Rise and Coastal Hazards

Single View | Background | Flood Scenarios | Year | Sea Level Rise | Storm Surge | View



POWERED BY Google

Scale = 1 : 27K

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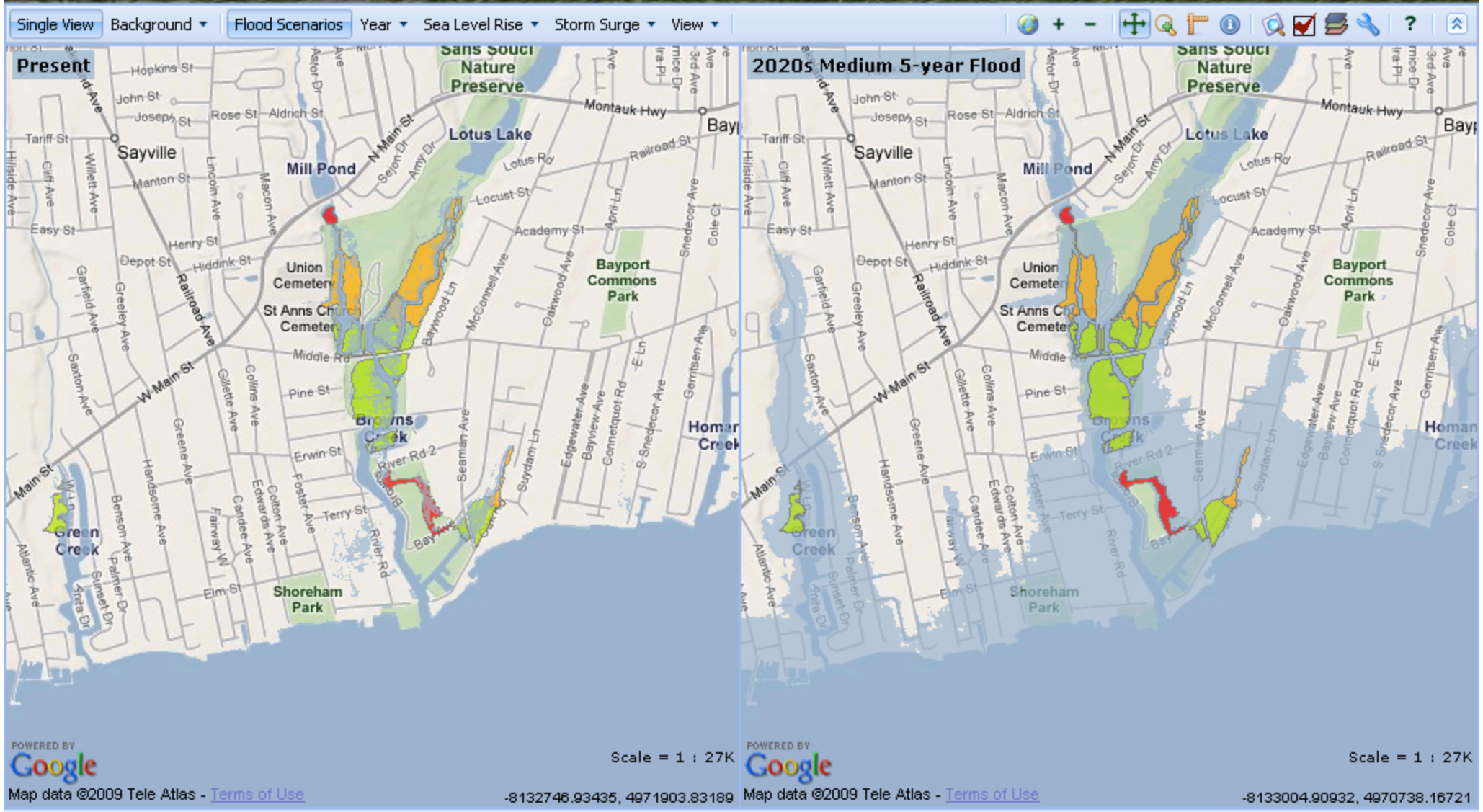
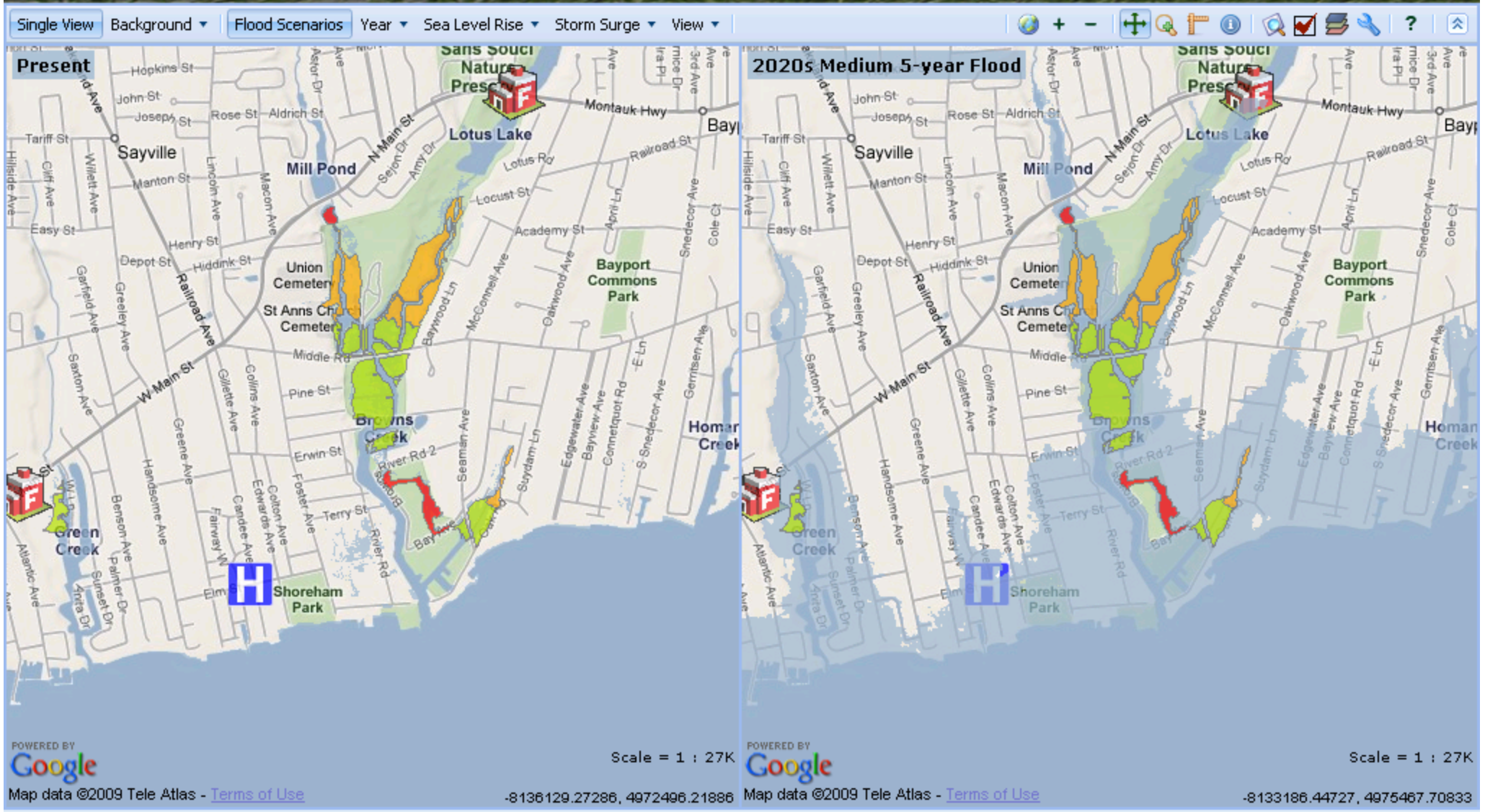
COASTAL RESILIENCE LONG ISLAND
Adapting Natural and Human Communities to Sea Level Rise and Coastal Hazards

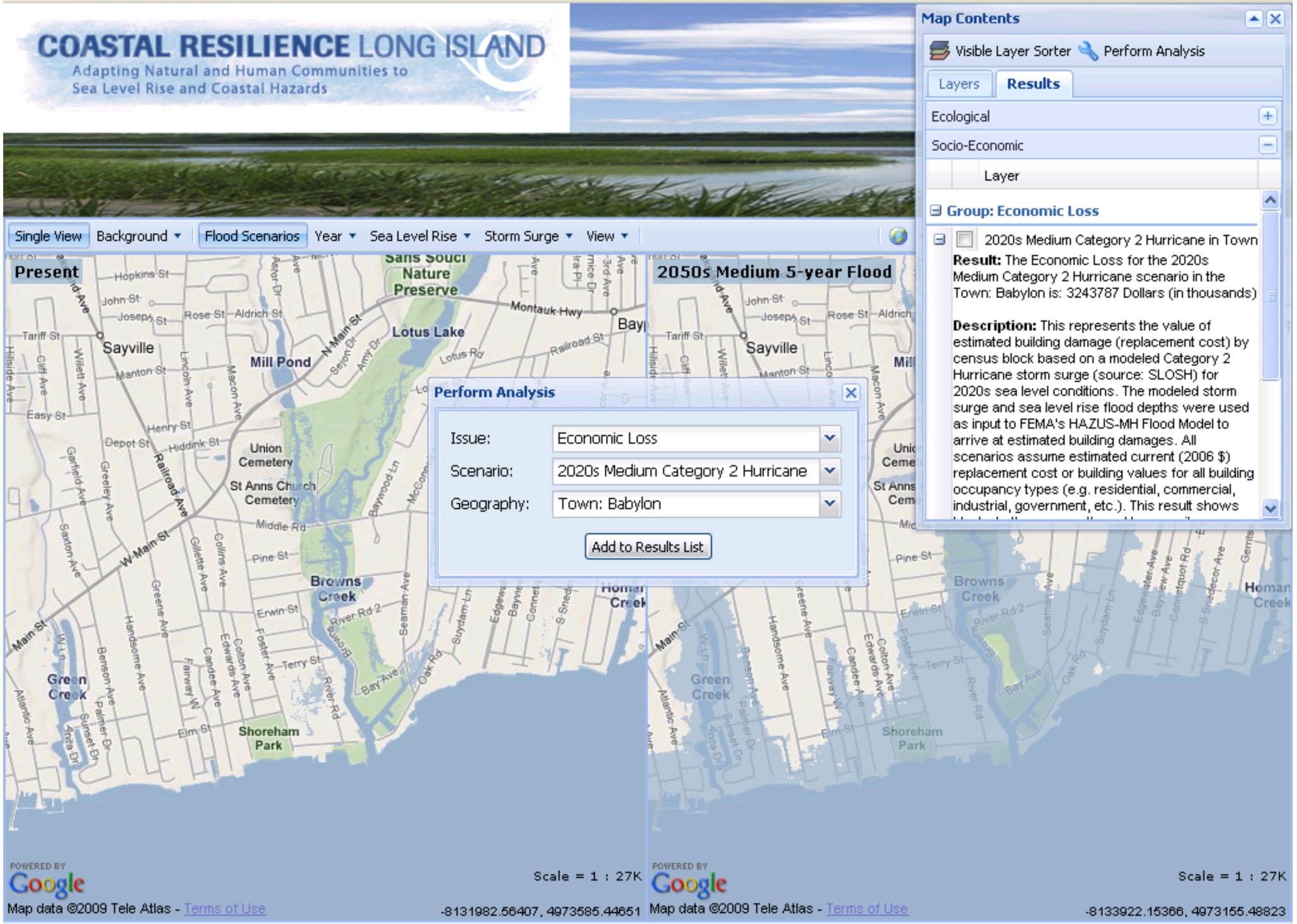
What's at risk?



COASTAL RESILIENCE LONG ISLAND
Adapting Natural and Human Communities to Sea Level Rise and Coastal Hazards

What's at risk?




COASTAL RESILIENCE LONG ISLAND
Adapting Natural and Human Communities to
Sea Level Rise and Coastal Hazards
Map Contents
Visible Layer Sorter
Perform Analysis
Layers
Results
Ecological
Socio-Economic
Layer
Group: Economic Loss
2020s Medium Category 2 Hurricane in Town
Result: The Economic Loss for the 2020s Medium Category 2 Hurricane scenario in the Town: Babylon is: 3243787 Dollars (in thousands)
Description: This represents the value of estimated building damage (replacement cost) by census block based on a modeled Category 2 Hurricane storm surge (source: SLOSH) for 2020s sea level conditions. The modeled storm surge and sea level rise flood depths were used as input to FEMA's HAZUS-MH Flood Model to arrive at estimated building damages. All scenarios assume estimated current (2006 $) replacement cost or building values for all building occupancy types (e.g. residential, commercial, industrial, government, etc.). This result shows
Single View
Background
Flood Scenarios
Year
Sea Level Rise
Storm Surge
View
Present
2050s Medium 5-year Flood
Perform Analysis
Issue:
Economic Loss
Scenario:
2020s Medium Category 2 Hurricane
Geography:
Town: Babylon
Add to Results List
Sayville
Mill Pond
Lotus Lake
Sans Souci Nature Preserve
Union Cemetery
St Anns Church Cemetery
Browns Creek
Green Creek
Shoreham Park
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Map data ©2009 Tele Atlas - Terms of Use
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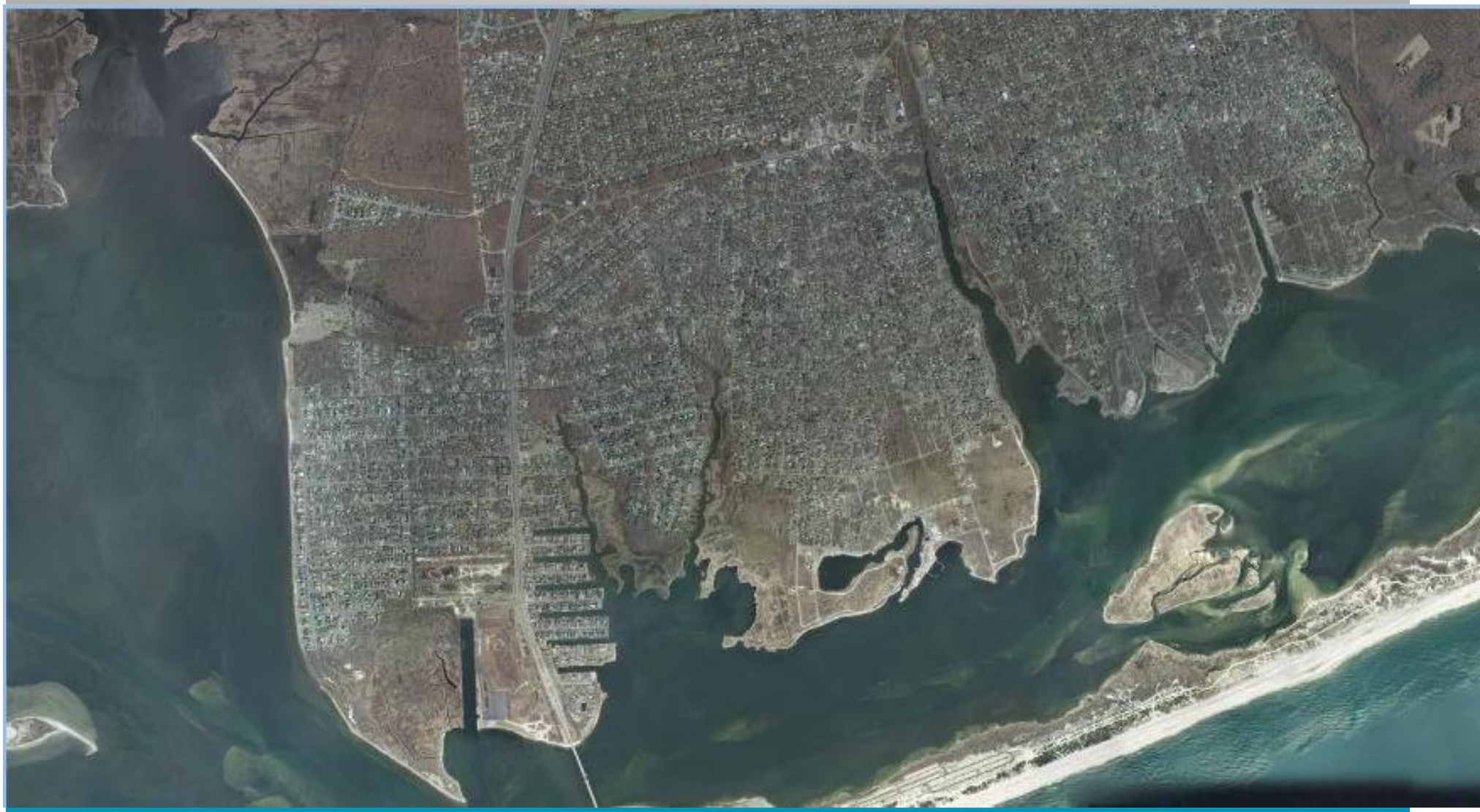
Current Conditions - Google



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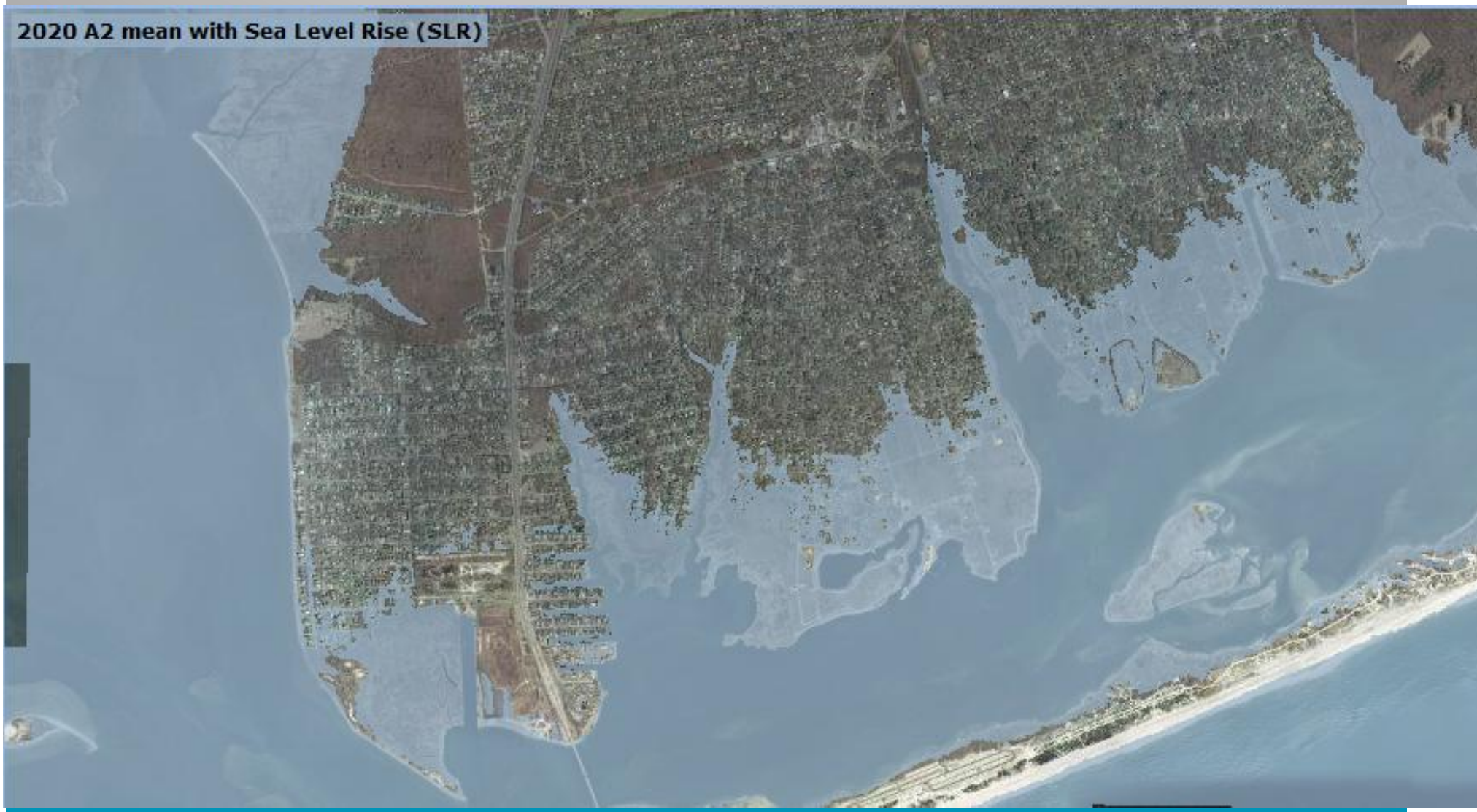
2020s moderate SLR



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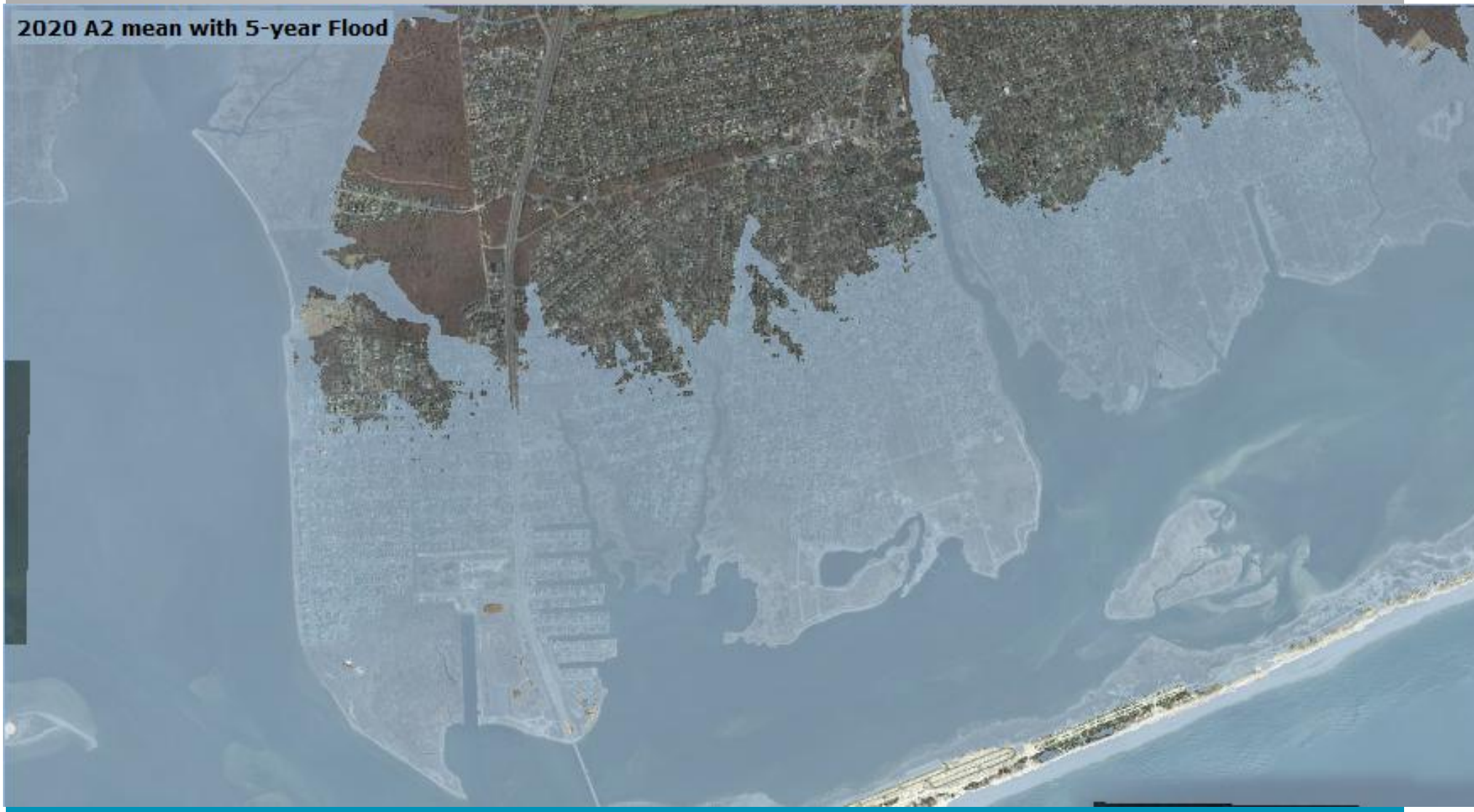
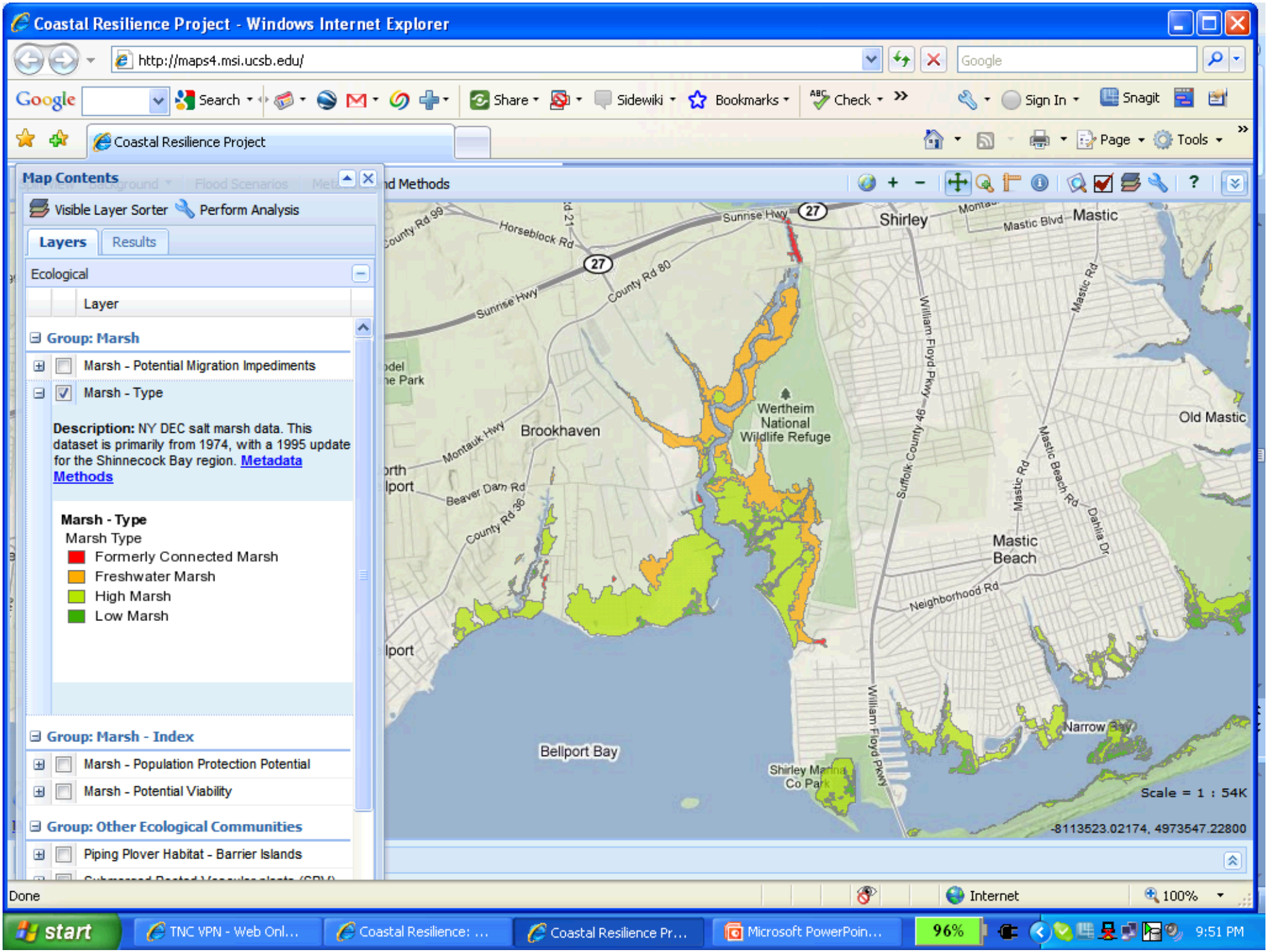
2020s SLR with 20% annual chance flood




Coastal Resilience Project - Windows Internet Explorer
http://maps4.msi.ucsb.edu/
Coastal Resilience Project
Map Contents
Visible Layer Sorter
Perform Analysis
Layers
Results
Ecological
Layer
Group: Marsh
Marsh - Potential Migration Impediments
Marsh - Type
Description: NY DEC salt marsh data. This dataset is primarily from 1974, with a 1995 update for the Shinnecock Bay region. Metadata
Methods
Marsh - Type
Marsh Type
Formerly Connected Marsh
Freshwater Marsh
High Marsh
Low Marsh
Group: Marsh - Index
Marsh - Population Protection Potential
Marsh - Potential Viability
Group: Other Ecological Communities
Piping Plover Habitat - Barrier Islands
Shirley
Mastic
Mastic Blvd
Sunrise Hwy
Horseblock Rd
County Rd 80
William Floyd Pkwy
Mastic Rd
Brookhaven
Wertheim National Wildlife Refuge
Old Mastic
Montauk Hwy
Beaver Dam Rd
Suffolk County 46
Mastic Beach Rd
Dahlia Dr
Mastic Beach
Neighborhood Rd
Bellport Bay
Narrow Bay
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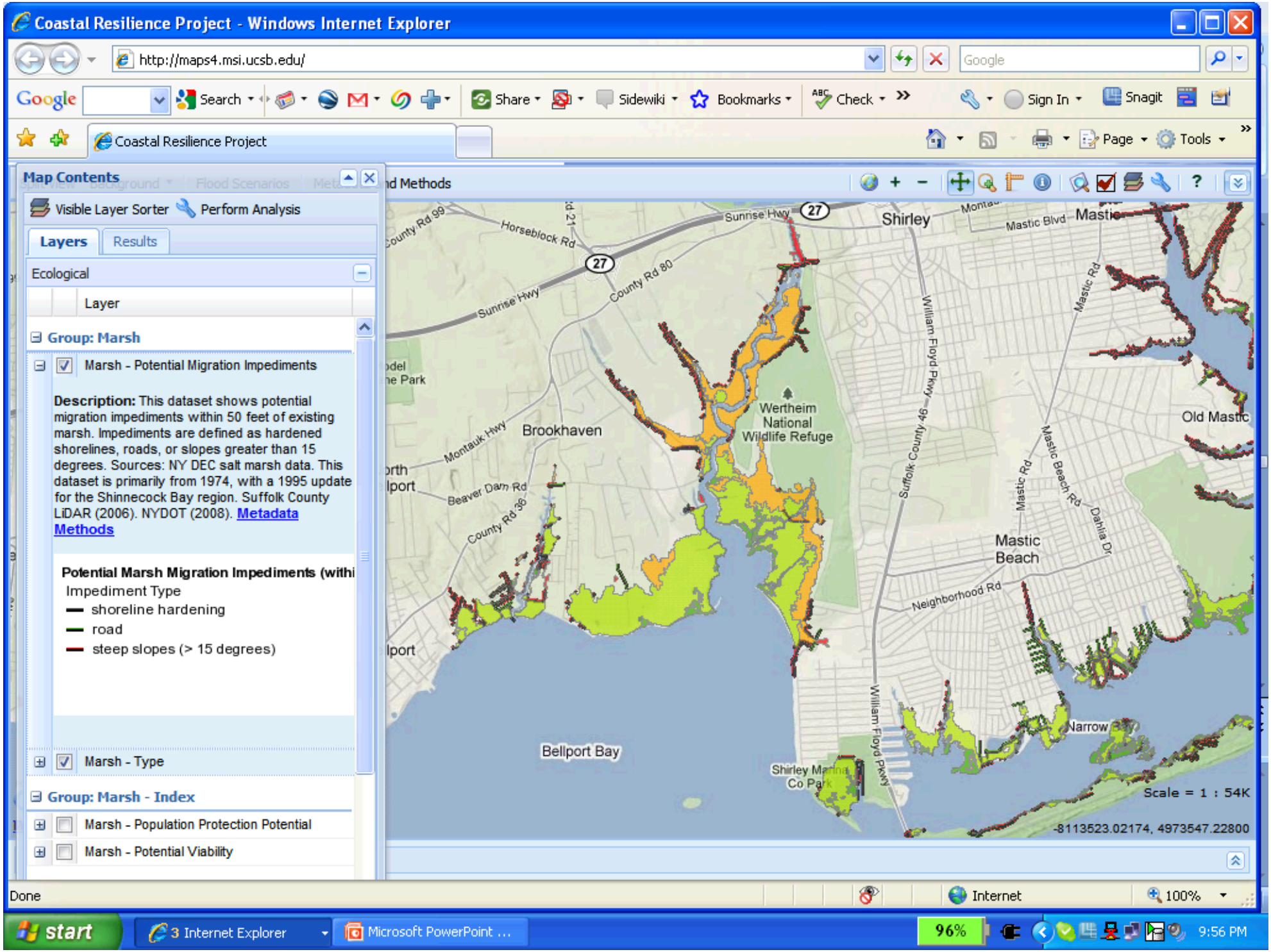
Coastal Resilience Project - Windows Internet Explorer
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Coastal Resilience Project
Map Contents
Visible Layer Sorter
Perform Analysis
Layers
Results
Ecological
Layer
Group: Marsh
Marsh - Potential Migration Impediments
Description: This dataset shows potential migration impediments within 50 feet of existing marsh. Impediments are defined as hardened shorelines, roads, or slopes greater than 15 degrees. Sources: NY DEC salt marsh data. This dataset is primarily from 1974, with a 1995 update for the Shinnecock Bay region. Suffolk County LiDAR (2006). NYDOT (2008). Metadata
Methods
Potential Marsh Migration Impediments (withi
Impediment Type
shoreline hardening
road
steep slopes (> 15 degrees)
Marsh - Type
Group: Marsh - Index
Marsh - Population Protection Potential
Marsh - Potential Viability
Shirley
Mastic
Mastic Blvd
Sunrise Hwy
Horseblock Rd
County Rd 80
William Floyd Pkwy
Mastic Rd
Brookhaven
Wertheim National Wildlife Refuge
Old Mastic
Montauk Hwy
Beaver Dam Rd
Suffolk County 46
Mastic Beach
Mastic Beach Rd
Dahlia Dr
Neighborhood Rd
Bellport Bay
Narrow Bay
Shirley Marina Co Park
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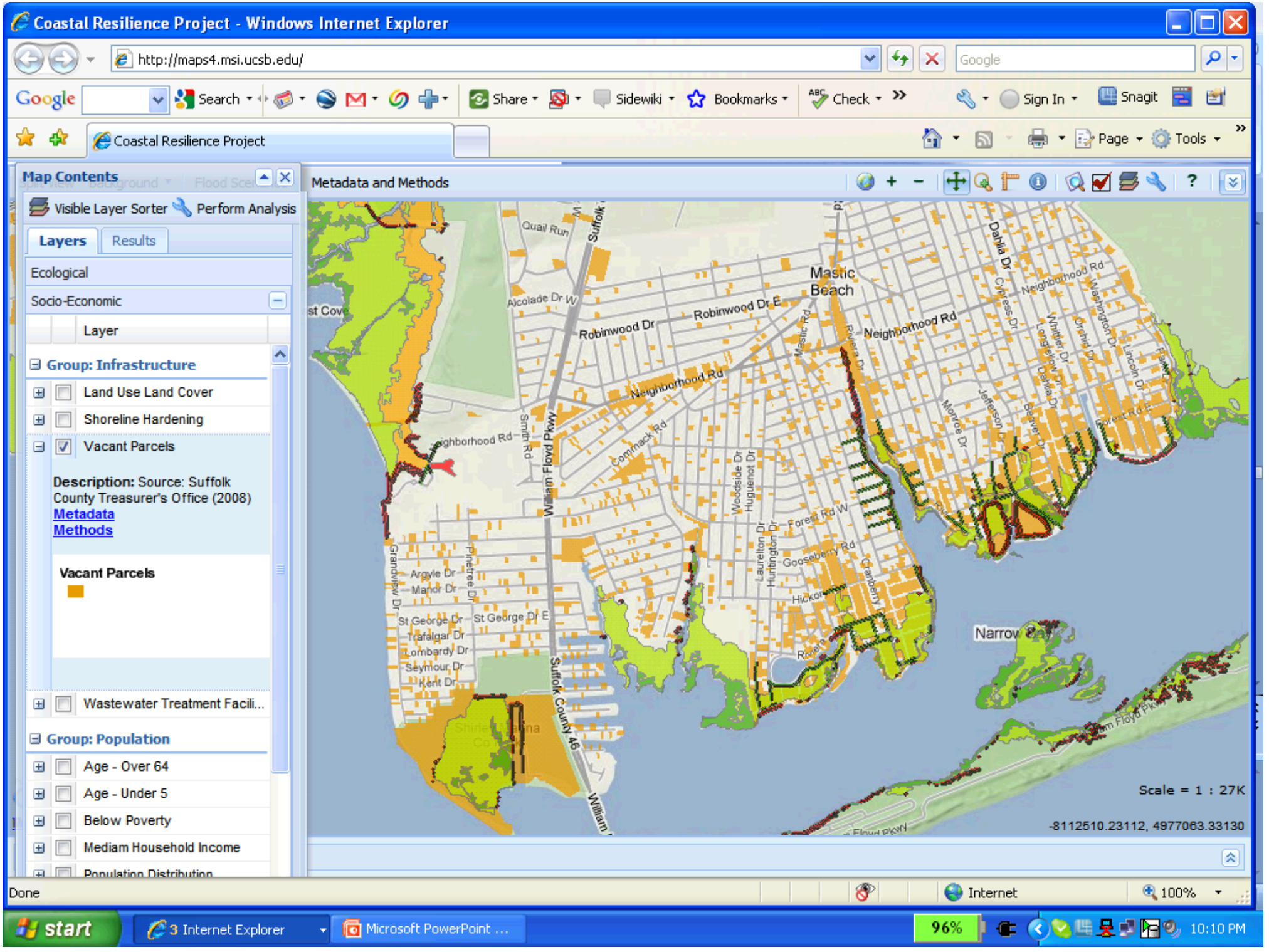
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Perform Analysis
Layers
Results
Ecological
Socio-Economic
Layer
Group: Infrastructure
Land Use Land Cover
Shoreline Hardening
Vacant Parcels
Description: Source: Suffolk County Treasurer's Office (2008)
Metadata
Methods
Vacant Parcels
Wastewater Treatment Facili...
Group: Population
Age - Over 64
Age - Under 5
Below Poverty
Mediam Household Income
Population Distribution
Metadata and Methods
Mastic Beach
Robinwood Dr
Robinwood Dr E
Neighborhood Rd
William Floyd Pkwy
Suffolk County 46
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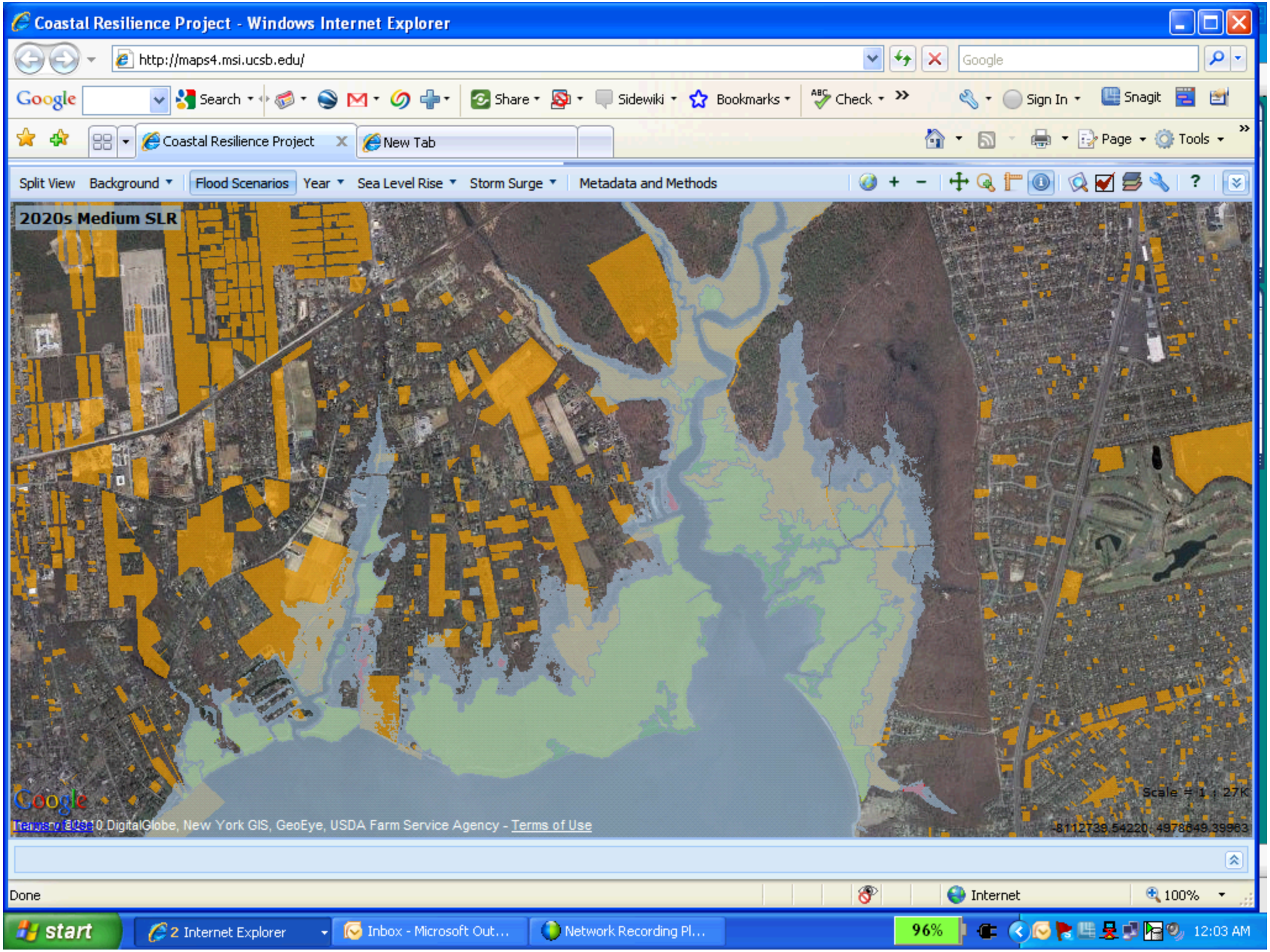
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Tools
Split View
Background
Flood Scenarios
Year
Sea Level Rise
Storm Surge
Metadata and Methods
2020s Medium SLR
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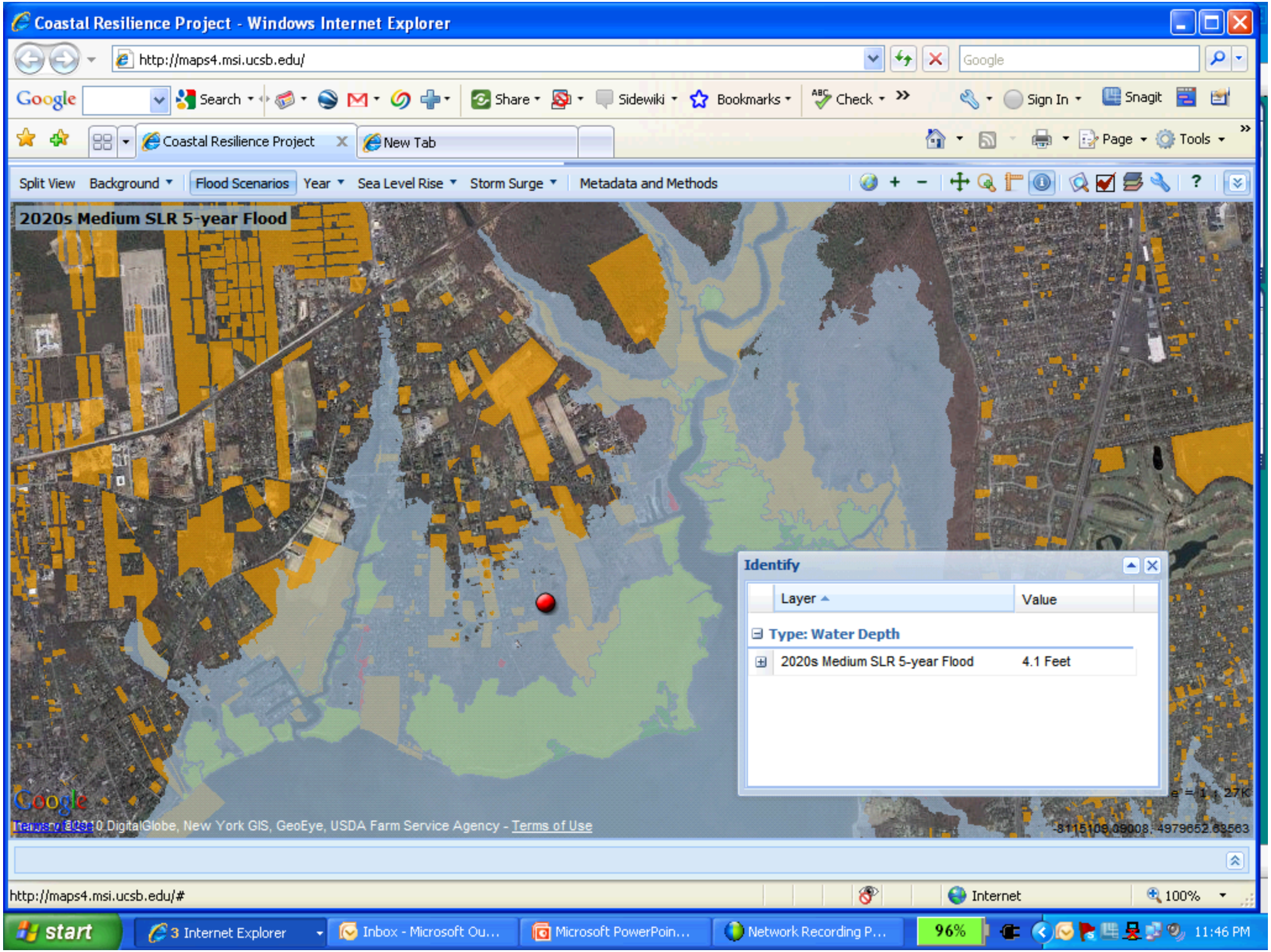
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Sign In
Snagit
Coastal Resilience Project
New Tab
Page
Tools
Split View
Background
Flood Scenarios
Year
Sea Level Rise
Storm Surge
Metadata and Methods
2020s Medium SLR 5-year Flood
Identify
Layer
Value
Type: Water Depth
2020s Medium SLR 5-year Flood
4.1 Feet
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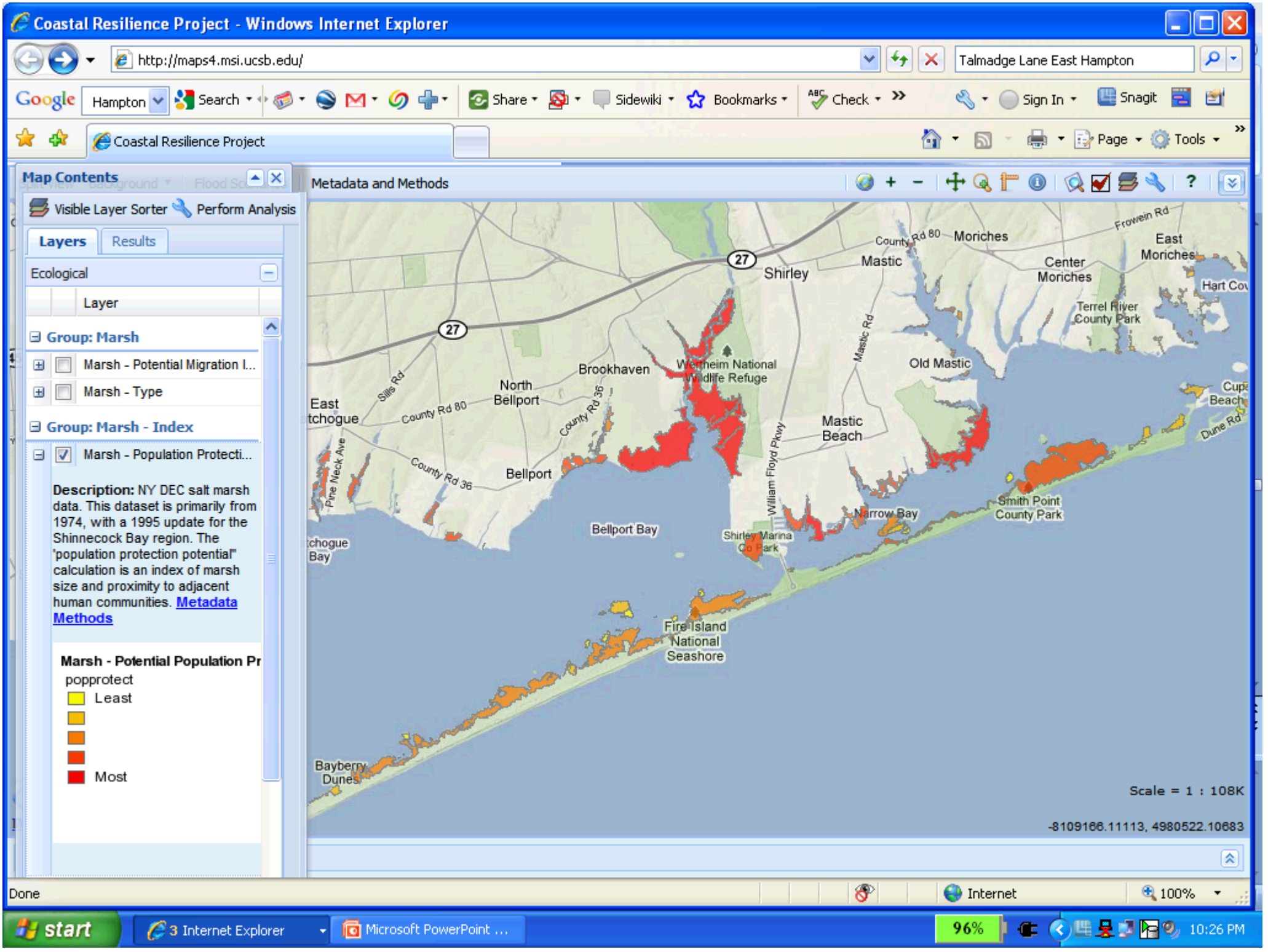
Coastal Resilience Project - Windows Internet Explorer
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Talmadge Lane East Hampton
Coastal Resilience Project
Map Contents
Visible Layer Sorter
Perform Analysis
Layers
Results
Ecological
Layer
Group: Marsh
Marsh - Potential Migration I...
Marsh - Type
Group: Marsh - Index
Marsh - Population Protecti...
Description: NY DEC salt marsh data. This dataset is primarily from 1974, with a 1995 update for the Shinnecock Bay region. The "population protection potential" calculation is an index of marsh size and proximity to adjacent human communities. Metadata Methods
Marsh - Potential Population Pr
popprotect
Least
Most
Metadata and Methods
Shirley
Mastic
Moriches
Center Moriches
East Moriches
Terrel River County Park
Old Mastic
Mastic Beach
Brookhaven
Wertheim National Wildlife Refuge
North Bellport
Bellport
East Patchogue
Bellport Bay
Narrow Bay
Shirley Marina
Smith Point County Park
Fire Island National Seashore
Bayberry Dunes
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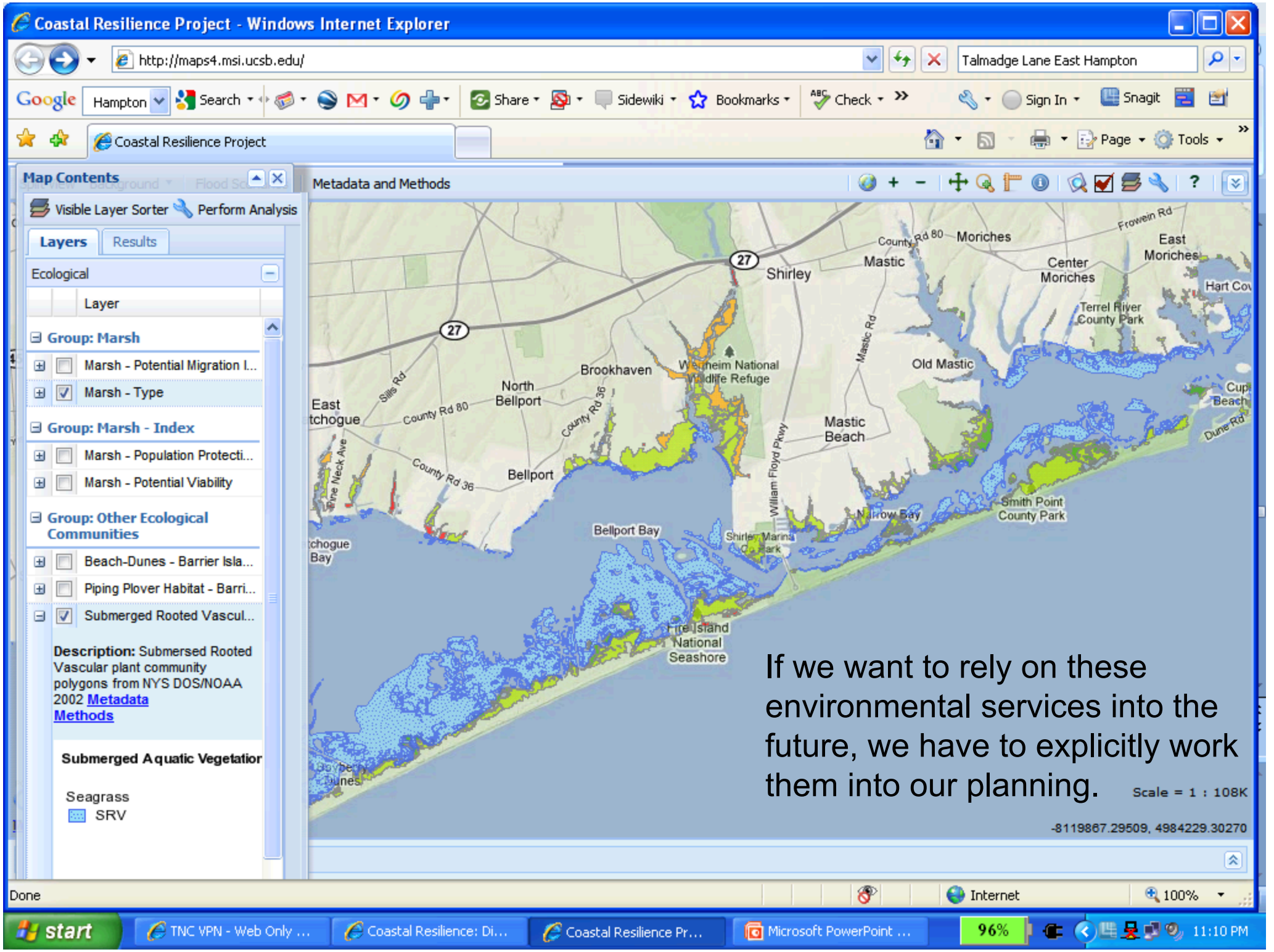
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Group: Marsh - Index
Marsh - Population Protecti...
Marsh - Potential Viability
Group: Other Ecological Communities
Beach-Dunes - Barrier Isla...
Piping Plover Habitat - Barri...
Submerged Rooted Vascul...
Description: Submersed Rooted Vascular plant community polygons from NYS DOS/NOAA 2002 Metadata Methods
Submerged Aquatic Vegetatior
Seagrass
SRV
Metadata and Methods
Shirley
Mastic
Moriches
Center Moriches
East Moriches
Terrel River County Park
Old Mastic
Mastic Beach
Brookhaven
North Bellport
Bellport
Bellport Bay
Smith Point County Park
Fire Island National Seashore
If we want to rely on these environmental services into the future, we have to explicitly work them into our planning.
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Next Steps for Coastal Resilience:

- Expand geographic extent;
- Develop additional ecosystem value displays/calculations
- Develop stronger connections between risks and solutions (geospatial presentation);
- Additional modeling: SLAMM or other model, storm surge
- Incorporate level of uncertainty with projections
- In-depth community engagement program (2 pilot communities).

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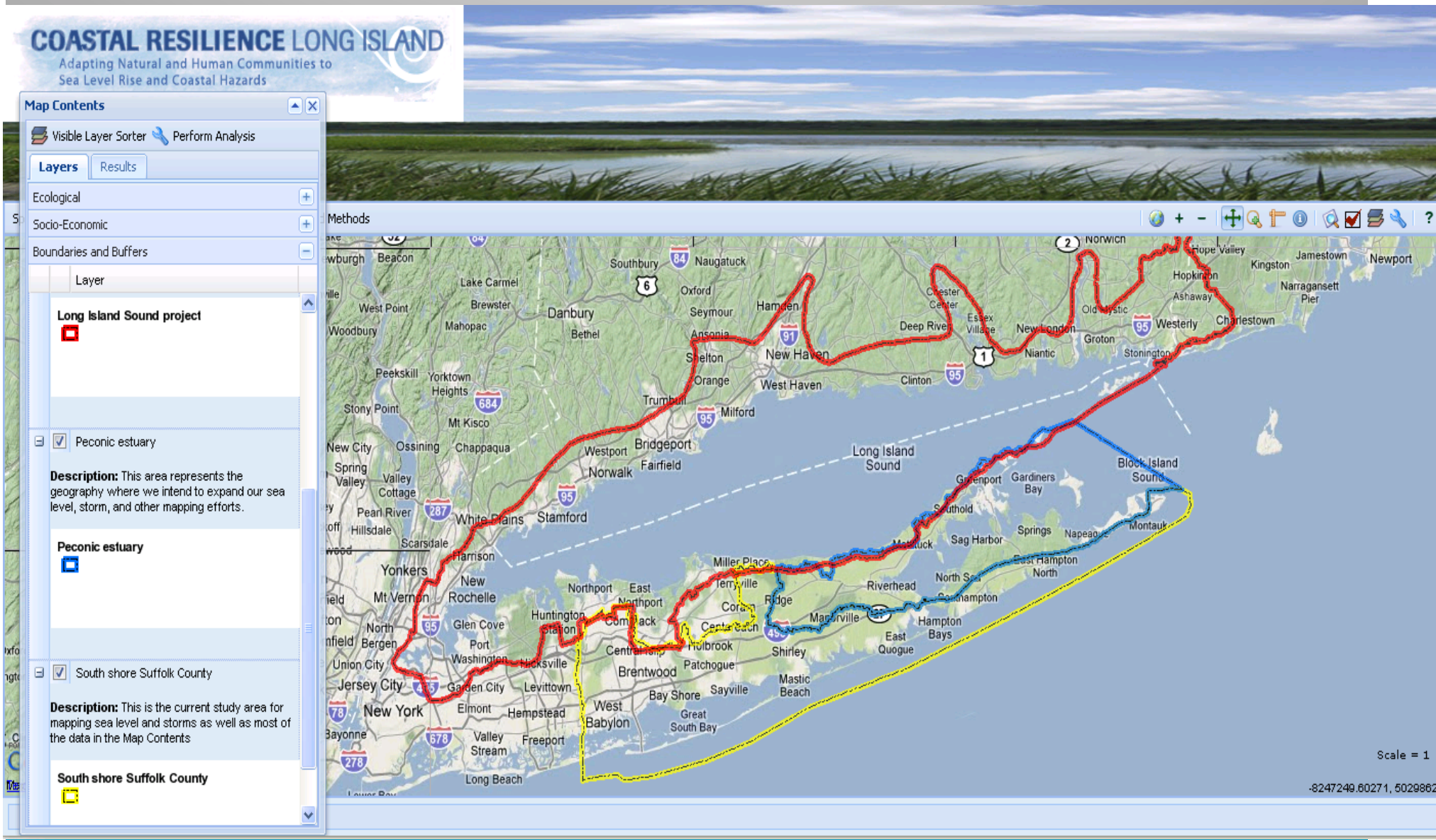
Coming Soon – Peconics and LIS



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Amend Key Laws

Why?

Existing management frameworks are uncoordinated and not designed to respond to a moving shoreline.

New York State:

- CEHA
- Tidal Wetlands Act

Federal:

- NFIP

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Plan for Sea Level Rise

Why?

- Changing land use patterns provides the greatest opportunity for protecting nature and people.
- Storms provide an opportunity for rethinking unwise development – post-storm redevelopment planning.

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Realign Public Structures

Why?

- Public entities should promote retreat by setting a good example; and
- Getting out of harm's way is the most effective way to protect important structures.

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Voluntary Land Acquisition

Why?

- Coastal parcels are uniquely vulnerable, and as sea level rises, people may voluntarily retreat;
- Coastal parcels are uniquely expensive, and get lost among other public land acquisition priorities;
- Getting people out of harm's way is the most effective form of adaptation.

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Restore Key Coastal Habitats

Why?

- Natural habitats – like salt marshes – provide natural storm damage mitigation;
- Natural habitats perform other valuable ecosystem services, like water quality improvement;
- Natural processes are essential for the maintenance and restoration of these habitats.

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Questions?